INSTRUCTION MANUAL

TEMPO one

28.000 - 26-500, -27.
28.5 - 27-27,500
29. - 27.5 - 28.000
29.5 - NO XTAL

HENRY RADIO STANDARD WARRANTY

Henry Radio warrants each new radio product manufactured by it to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part in exchange for any part of any unit of its manufacture which under normal installation, use, and service discloses such defect, provided the unit is delivered by the owner to us intact, for our examination, with all transportation charges prepaid to our factory, within ninety days from the date of sale to original purchaser and provided that such examination discloses in our judgment that it is thus defective. Should a malfunction be suspected, write in detail to our Service Department for suggestions concerning the operation, repair, or return of your unit if it should prove necessary.

This warranty does not extend to any of our radio products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of instructions furnished by us, nor does it extend to units which have been repaired or altered outside our factory, nor in cases where the serial number there of has been removed, defaced, or changed, nor to units used with accessories not manufactured or recommended by us.

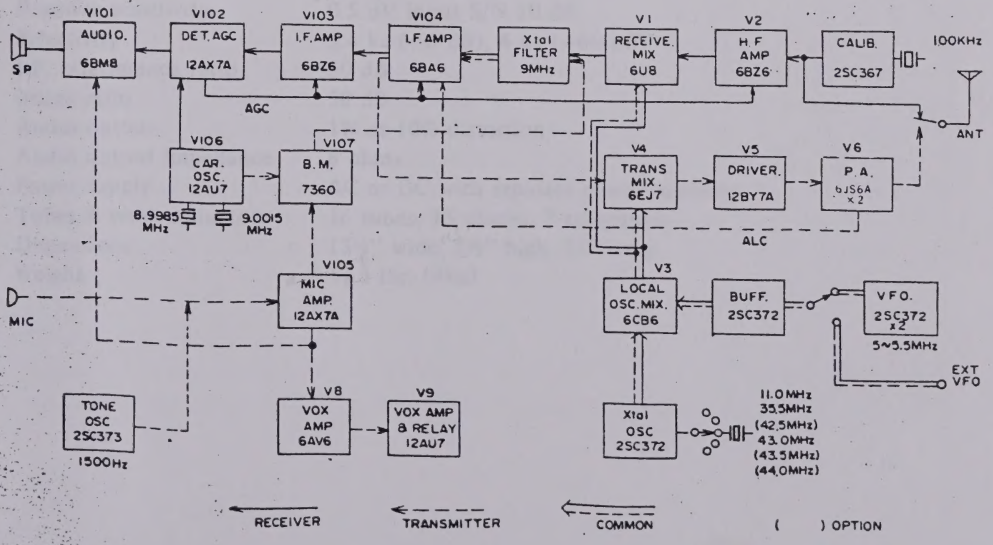
Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by Henry Radio without charge to the owner.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our radio products.

Henry Radio reserves the right to make any improvements to its products which it may deem desirable without obligation to install such improvements in its previously manufactured products.

SER # 710097

TEMPO one BLOCK DIAGRAM



TEMPO one SSB TRANSCEIVER

The *TEMPO one* Transceiver, for HF amateur bands 80 through 10 meters, is a precision built high performance transceiver providing SSB (USB and LSB selectable), CW and AM modes of operation, with a single-tone power of 240W (approx. 300W speech peak input).

High stability is obtained by use of a well designed heterodyne VFO, and the specially designed 9 MC crystal filter ensures good voice quality.

Its compact size, light weight, and attached carrying handle make it very suitable and convenient for both home, portable, and mobile use.

Other features include VOX, 100 kc calibrator, ±5 kc receiver offset (clarifier) tuning and easy connection for use of a Linear Amplifier.

TEMPO/AC one matching AC power supply with built-in speaker is especially designed for use with the Transceiver, A 12V DC supply; the *TEMPO DC/one* provides for mobile or field use.

GENERAL SPECIFICATIONS

Modes	SSB (USB–LSB), CW, AM
Input power	240W
Frequency range	3.5–4; 7–7.5; 14–14.5; 21–21.5; 28.5–29. (crystals optionally available for ranges 28–28.5; 29–29.5; 29.5–30 MC)
Antenna impedance	50-100 ohms
Frequency stability	After warm-up, within 100 cps/ every 30 minutes
Carrier suppression	–40 dB
Sideband suppression	–50 dB at 1000 cps
Third order intermodulation products	–30 dB (P.E.P.)
A.F. bandwidth	300–2700 cps
Receiver sensitivity	0.5 uV input S/N 10 dB
Selectivity	2.4 kc (–6 dB), 4 kc (–60 dB)
I.F. interference ratio	50 dB
Image ratio	50 dB
Audio output	1W at 10% distortion
Audio output impedance	8 ohms
Power supply	AC or DC with separate power supplies
Tubes & semiconductors	16 tubes, 15 diodes, 7 transistors
Dimensions	13¼" wide, 5½" high, 11" deep
Weight	17.5 lbs. (8kg)

TEMPO AC/one SPECIFICATIONS

Semiconductors	9 diodes
Dimensions	8" wide, 5½" high, 11" deep
Weight	Approx. 22 lbs. (10kg)
Speaker (built-in)	5" x 3", 8 ohms
Supply voltage	100V/110V/117V/200V/220V/234V 50–60 cps

TEMPO DC/one SPECIFICATIONS

Matching DC power supply	
Semiconductors	4 transistors, 9 diodes
Dimensions	8" wide, 2¾" high, 8⅞" deep
Weight	Approx. 6.6 lbs. (3kg)
Power source	DC-12V, 12.5A (receive), 15A (transmit), 27A (transmit 100W peak)

CIRCUIT DESCRIPTION

It can be seen from the block diagram that many sections are common for both receiving and transmitting. For an easier understanding of the operation, the receiving and transmitting sections will be described separately.

Receiving Section

Signal from ANT terminal passes through antenna RX/TX relay to ANT input tuned circuit to grid 1 of RF amplifier tube V2, 6BZ6. Signal is amplified and through the next tuned circuit on the grid of receiver mixer tube V1, 6U8, pentode section. Local oscillator signal is applied to cathode of this mixer and the I.F. signal appears at mixer plate. The I.F. signal then passes through the 9 MC crystal filter to the two stage amplifier V104, 6BA6, V103, 6BZ6 and thence to V102A, ½12AX7 power grid detector. This detector acts as a product detector, with BFO signal applied to its cathode, when receiving CW and SSB. V102B, ½12AX7 functions as an anode detection type amplifier of AGC. With no signal applied, plate current is zero with plate voltage zero. When signal is applied, plate current develops, resulting in a negative plate voltage which is applied through diode D103 to AGC line. Circuit provides suitable AGC characteristics of fast attack, slow decay for SSB and CW. Internal resistance of diode is low in forward direction and high in reverse direction. AGC voltage is applied to RF and IF stages so that a wide range of signal levels can be handled. Detector output is fed to silicon diodes D101, D102, ANL, then via AF gain control, through 6BM8 AF output tube to speaker or headphones.

Transmitting Section

Output of carrier oscillator V106, 12AU7 is injected to first grid of V107, 7360 balanced modulator and audio signal from mic. Amp. to modulating grid of BM. Suppressed carrier

DSB is developed at plate of BM. This signal then passes through the crystal filter XF101, which eliminates one sideband, thus resulting in a SSB signal, 9 MC.

For AM transmission (sideband with carrier insertion) the BM becomes unbalanced because of switching circuitry, permitting carrier to pass through, and also carrier frequency is shifted by means of a varicap diode circuit so that carrier passes freely through filter pass-band. Amount of carrier insertion level is adjustable by AM carrier control VR8.

For CW transmission, audio is disabled, and similarly as for AM, the BM is unbalanced and carrier frequency shifted to allow full carrier to pass through filter.

In the TUNE condition, a 1500 cps signal from the audio tone oscillator TR503 is applied to the BM. This provides a convenient tuning signal near filter center frequency. Level of signal is controlled by mic. gain control.

The 9 MC signal, after passing through the filter, is amplified by IF amplifier tube V104, 6BA6, thence to grid of mixer tube V4, 6EJ7, together with local oscillator signal. The resultant difference between these two frequencies appears at plate tuned circuit of mixer and is the transmitting ham band output signal frequency. On 14 MC band, additive mixing is used.

This signal is amplified by V5, 12BY7 tuned driver and finally to power amplifier tubes V6/V7, 2 x 6JS6A, and antenna. Power amplifier V6/V7 operates in class AB2 for maximum power output.

The AC audio component of PA grid current, when overdriven by signal peaks, is rectified by diodes D4/D5 to provide an ALC (Automatic Level Control) voltage to the IF amp. stage thus reducing its gain and maintaining low distortion.

The PA Pi network plate circuit provides attenuation to the higher order harmonics and enables easy, flexible adjustment of impedance matching to antenna feedline.

On phone, PTT and VOX control is available. On VOX, a sample of signal from microphone is applied to grid of V8 and then to V9A, rectified by diode D2, SH-1, producing a positive bias on the grid of V9B relay tube, causing plate current to flow and relay to actuate.

On CW, "straight" or "break-in" keying methods are available. Break-in is produced by keying audio oscillator tone applied to VOX amp. as well as transmitter bias line. The relay switches bias on V107, V4, V5, V6 and V7.

Tone signal also can be heard from speaker while keying, thus providing sidetone monitoring.

OSCILLATOR CIRCUITS

In the *TEMPO one* crystal oscillators are used for carrier generation and the bandswitched heterodyne oscillator, together with a self-controlled oscillator for VFO, which is at a frequency low enough to obtain good stability. Other oscillators included are 100 kc crystal calibrator and audio tone oscillator. An exteral VFO model *TEMPO VF/one* is available to provide additional operational flexibility and split frequency operation.

1. **Carrier crystal oscillator**

V106, 12AU7 double triode with crystals 8998.5 kc and 9001.5 kc, one in each triode section. With sideband selector switch at NORMAL, carrier crystal 8998.5 is operative for 7 and 14 MC band and 9001.5 for 3.5, 21 and 28 MC. When the selector switch is in REVERSE position, then the carrier crystal oscillator sections are changed.

Carrier oscillator operates like the BFO when in receive mode.

On AM & CW, crystal 9001.5 is used and its frequency is lowered 200 cps by diode switch D104, 1S1007, bringing carrier into filter passband.

2. **Bandswitched heterodyne oscillator**

This is a crystal oscillator using silicon type 2SC372 transistor, and it is operative on bands 7, 21 and 28 MC. 10 M band crystal is included for 28.5–29 MC, and positions are available for other three optional ranges for full coverage of 10 M.

3. **VFO self-oscillator**

The VFO is a transistorized Colpitts circuit with 2SC372 oscillator and 2SC372 buffer. It has linear tuning over the range 5 – 5.5 MC. A passband filter circuit at output is tuned to pass the 5 – 5.5 MC range. Varicap diode D401, 1S145 permits receiver off-set tuning control $\pm$5 kc on receiving.

4. **Crystal calibrator oscillator**

Transistor oscillator 2SC367 with 100 kc crystal, and diode type 1S1007 harmonic generator provides accurate check points every 100 kc on main dial.

5. **AF oscillator**

The phase shift type with 2SC372 transistor, generating audio tone signal at 1500 cps, supplies transmitter tune-up signal and CW sidetone monitoring. This oscillator also actuates VOX relays for semi-automatic break-in CW operation.

LOCAL OSCILLATOR MIXER CIRCUIT

VFO output is applied to grid 1 of V3, 6CB6 mixer and heterodyne oscillator output to cathode. Resultant beat frequency is selected in plate tuned circuit.

METER CIRCUIT

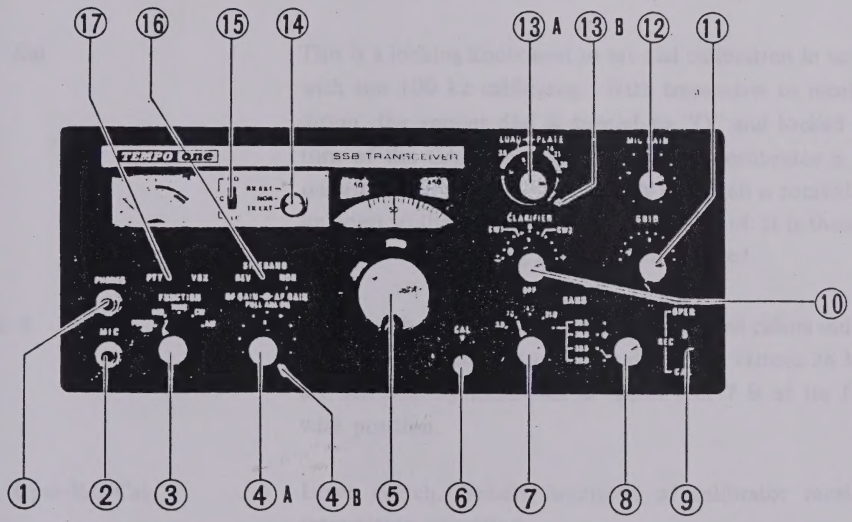
Meter is 1 mA movement, and it is connected to 2nd IF stage to read change in cathode voltage of V103, resulting from variations of AGC voltage, to indicate receiver "S" units.

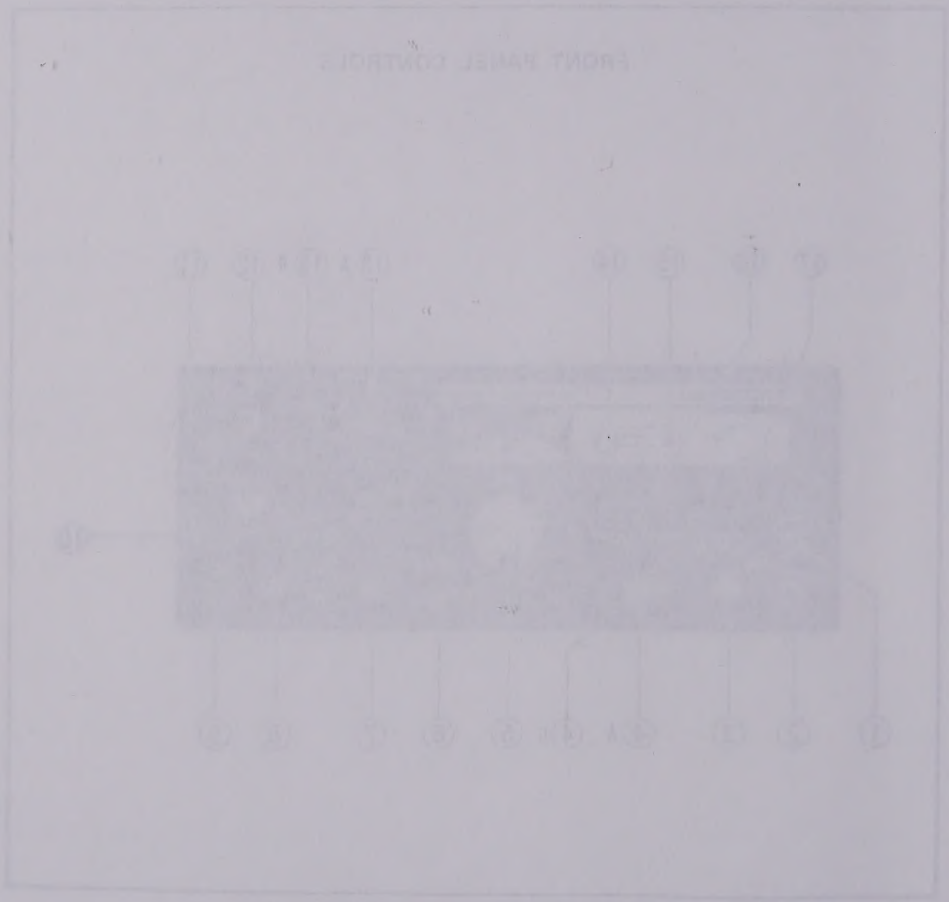
Meter is automatically switched by relay RL101, on transmitting, to indicate relative power output (PO) PA cathode current (IC) and ALC voltage. Meter scale is fully calibrated, and transmitter metering functions PO, IC and ALC, are selected by panel mounted slide switch.

VOLTAGE REGULATOR CIRCUIT

The voltage regulator circuit, mounted on a print board, provides 9 volts for all transistor oscillators. Two transistors are used, 2SC372 and 2SC367, together with two zener diodes, 1S331 and 1S336, and voltage level can be set by adjustment of variable resistor VR501.

FRONT PANEL CONTROLS





1. Phones	Headphone socket. Impedance 600 ohms. When plug is inserted into socket, speaker is automatically disconnected.
2. Mic.	Microphone socket. Standard ¼" 3 contact T.R.S. type. High impedance. Tip relay control. Ring microphone audio. Sleeve ground.
3. Function	Function switch. OFF — AC power removed from power supply. SSB — Selects SSB operation. TUNE — Places TX in tune-up condition. CW — Selects CW operation. AM — Selects AM operation.
4A. AF Gain, Pull-ANL-On	Knob
4B. RF Gain	Level control
5. VFO	Control knob and vernier drive. One revolution of knob covers approx. 15 kc. Upper windows give 50 kc points with 0—500 markings. The vernier scale is marked in 1 kc steps, 0—100.
6. Cal	This is a locking knob used to set dial calibration in conjunction with the 100 kc calibrator. With transceiver in receiving condition, the vernier dial is turned to "O" and locked by a half turn of the CAL locking knob. 100 kc calibrator is switched on with control No. 9. Then the VFO knob is rotated to a 100 kc point so that calibrator beat note is heard. It is then adjusted for zero beat. Locking knob is then released.
7 & 8. Band	Bandswitch, marked for bands in MC. Red colors indicate that red scale is to be used on VFO dial. The various 28 MC ranges are selected by knob No. 8 when No. 7 is at its full clockwise position.
9. Oper-Rec-Cal	Lever switch. Selects functions of calibrator receiving and transmitter operation.
10. (Receiver off-set-tuning)	Clarifier adjustment. It provides ±5 kc variation of receiver tuning ("off-set-tuning"). When switched to OFF, the receiving and transmitting frequencies are the same.

11. Grid — Controls RF tuning of receiver and drive tuning of transmitter.

12. Mic. Gain — Controls microphone amp. level. On TUNE it becomes a tuning level control.

13A. Plate — Knob. Adjusts PA plate tuning.

13B. Loading — Lever. Adjusts PA plate loading.

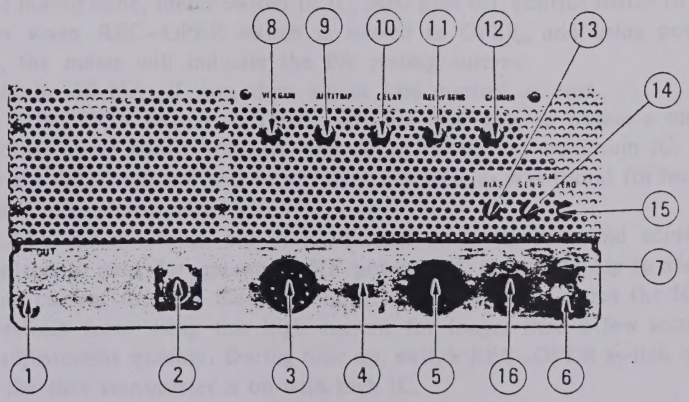
14. VFO Select — For switching from internal to external VFO. NOR is transceive on internal VFO. RX EXT is receive on external VFO, transmit on internal VFO. TX EXT is transmit on external VFO, receive on internal VFO.

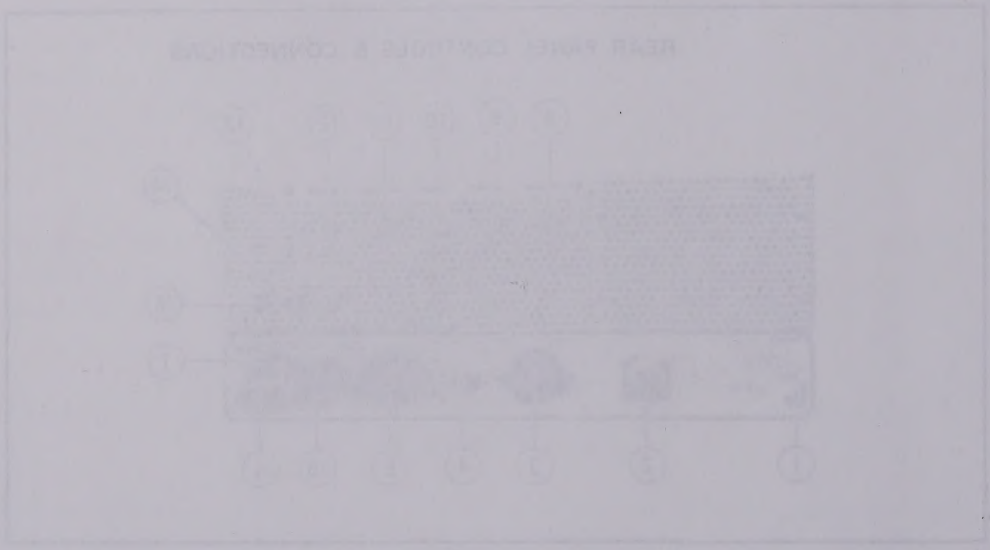
15. PO–IC–ALC — Meter selector switch. Switches meter functions for transmitter metering.

16. Sideband — Sideband selector slide switch. In the NORMAL position, LSB is produced on 3.5 and 7 MC, and USB on 14, 21 and 28 MC. In the REV position, USB is produced on 3.5 and 7 MC and LSB on 14, 21 and 28 MC.

17. PTT–VOX — Slide switch. Selects PTT or VOX functions.

REAR PANEL CONTROLS & CONNECTIONS





1. **Set controls as shown below**

First check that all cable connections are correct and that antenna of correct frequency and impedance within the range of the Pi-net (50 100 ohms) (coax output) is connected tc the transceiver. AC power plug should not be-connected until all preliminary checks are carried out. Aux plug provided should be inserted in auxilary VFO socket if external VFO, ***TEMPO VF/one*** is not used. Turn power on with function switch to SSB position. Panel lamps should light and S-meter needle will show a full scale reading Then slowly return to "O" as set warms up. This can be accepted as an indication that the set is then ready for operation.

Tune GRID for noise peak.

Adjust main tuning dial for signal.

Peak GRID for maximum S-meter reading.

Careful tuning is necessary to obtain correct tone of SSB signal. If the received signal is on opposite sideband, then move REV–NOR switch to REV.

A beat note indicates that an AM signal is being received. In this event turn function switch to AM. Adjust AF gain for comfortable listening volume. Sometimes a slight reduction of RF gain will obtain clearer reception.

2. **Transmitter tuning**

IMPORTANT :

Heater voltage to final tubes 6JS6A is supplied through a jumper wire between pin 1 and 2 of accessory plug, so the accessory plug must be placed in the accessory socket to provide this heater voltage.

Transmitter should be tuned into a 50 ohm dummy load, but it may be tuned on an antenna provided that the band is clear; and no interference will result to other stations. Take care to ensure that transmitter frequency is adjusted within frequency limits of band in use.

DO NOT OPERATE TRANSMITTER with no load connected; otherwise PA tubes could be damaged.

Disconnect microphone, meter switch to IC, MIC gain off, control switch to PTT, function SSB. Then when REC–OPER switch is moved to OPER, and using power supply of 600V HT, the meter will indicate the PA resting current.

This should be 60 MA; if not, then adjust bias control at rear.

Now turn FUNCTION switch to TUNE, advance MIC gain to obtain a small increase in meter reading, up to about 100 MA, and adjust GRID for maximum IC. Note that the setting for the GRID control will be virtually the same as was found for receiving. Reduce MIC gain if IC rises abnormally high.

Adjust PLATE for minimum dip in IC. Switch meter to P.O. and adjust PLATE and LOAD controls in turn for maximum RF power out. IC should dip to about 70/80% of the off-tune current for best loading condition. At maximum input the IC is about 350 MA, but refrain from using this high current for longer than a few seconds; therefore make all adjustments quickly. During tune-up, switch REC–OPER switch off periodically to reduce the time transmitter is on with high IC.

While it is permissible to tune transmitter, using meter on P.O. position, it is recommended that an external SWR meter be connected between antenna socket and feedline, not only to check matching of transceiver to antenna feedline and observation of transmitter RF output, but so that transceiver meter can be left in IC position for constant monitoring of PA current. Any abnormal rise-in IC can then be noted and quickly corrected.

ALIGNMENT

The *TEMPO one* has been correctly aligned at factory and, under normal circumstances, realignment should not be necessary except after a long period of use. The alignment of such modern, sophisticated equipment as this requires the correct test instruments and should not be attempted unless one has had a reasonable amount of experience in such alignment techniques.

CAUTION – Before any work is attempted, remember that high voltages are employed in this equipment, so – TAKE CARE!

1. **Equipment required**

   VTVM with RF probe
   RF standard signal generator
   AF signal generator
   Circuit tester
   Frequency meter
   Dummy load 50 ohms
   Suitable alignment tools

2. **Voltage and resistance measurement**

   Refer to tables on Page 17

   Note that measurement figures obtained could vary slightly from those shown, particularly if a low resistance testing meter is used. Always turn off power, remove AC plug, and completely discharge all filter condensers before taking measurements.

3. **Voltage regulator**

   The V.R. is mounted on a printed circuit board and supplies a regulated output of 9V, adjustable by the pre-set type miniature pot VR501. If output cannot be brought up to the 9V, level it may be due to a fault in components on the printed circuit board, e.g. transistors or zener diode, or supply voltage below 11V.

4. **VFO alignment**

   On the red scale, "O" –5 MC and "500" = 5.5 MC.

   Switch off crystal heterodyne oscillator by placing bandswitch on 3.5 or 14 MC band. (Receiver offset tuning) OFF.

   Use frequency meter for alignment, although this can be done, with care, if beats are heard every 100 kc using the crystal calibrator.

   Coarse alignment is by adjustment of trimmer TC401.

   The piston type trimmer TC402 is for adjustment of temperature compensation. If turned clockwise, then compensation becomes greater. If TC402 is adjusted, then TC401 must be re-adjusted to maintain calibration.

   For precise adjustment of dial linearity, careful adjustment (by bending) of end rotor plates of main tuning condenser is necessary.

VFO injection to grid 1 of V3, 6CB6 should be 0.5V or more over full VFO range, measured with VTVM and RF probe. To obtain same frequency of clarifier at "O" as at "OFF", adjust VR7.

5. **Heterodyne crystal oscillator**

Apply RF probe to Pin 2 of V3, and with bandswitch at 28.5, adjust L202 for maximum meter reading.

On 21 MC band adjust TC202.

On 7 MC band adjust TC201

If optional 10 meter range crystals are added, use type HC18U crystals with wire leads soldered into marked positions on heterodyne oscillator print board.

Adjust appropriate trimmer condensers for 10 meter crystals.

6. **Calibrator 100 kc**

Adjust frequency with TC301 by checking against WWV, with aid of separate receiver.

7. **Pre-mixer (VFO mixer)**

This is V3, with output plate tuned circuit to select resultant beat of VFO and heterodyne oscillator (or VFO frequency in case of 3.5 and 14 MC bands).

This alignment should be carefully done as other frequencies can appear at output, VFO, etc. This alignment is explained in transmitter alignment section. Refer to chart, below, for correct output frequencies.

Band	Mixed Frequency
3.5	5 – 5.5 MHz
7.0	16 – 16.5 MHz
14.0	5 – 5.5 MHz
21.0	30 – 30.5 MHz
28.0	37.0 – 37.5 MHz
28.5	37.5 – 38 MHz
29.0	38 – 38.5 MHz
29.5	38.5 – 39 MHz

RECEIVER ALIGNMENT

1. **Audio output stage**

Connect audio generator with 1000 cps output of 0.1V level to moving arm terminal of AF gain control, and with control at maximum volume, an output of 1 watt should be obtained from the 6BM8, V101.

2. **AGC**

Function switch to AM, RF gain maximum, then S-meter should read "O" with antenna socket shorted. Set VR102 (AGC adjust) so that it is at a point just before S-meter needle commences to rise above "O". Now adjust meter sensitivity control so that, with S.G. 50 uV signal to antenna socket, meter will read S9. Open circuit output

of S.G. will be 100 uV, dropping to 50 uV when S.G. is connected to antenna socket, because of loading effect of receiver. Now set function switch to SSB, short out antenna socket, and meter should read "O"; but if not, then adjust the compensation capacitance (C165) between pin 2 and pin 8 of V102 to make meter read minimum deflection.

3. **I.F. amplifier**

Connect signal generator at 9,000 kc and adjust tuning for maximum S-meter reading at center of filter passband by observing S-meter at same time as tuning S.G. frequency. Now adjust L101, L102, L103, L104 for maximum meter reading.

4. **Receiver mixer**

This is V1 6U8 (alternative types 6EA8, 6GH8). Connect RF probe to pin 8, cathode of triode section, and adjust grid tuning. Oscillator injection should read greater than 0.5V on every band. Adjust trap coil L22 for minimum beat at 21.3 MC. This adjustment should occur within one turn of the core slug. L1 is trap coil for 3.5 and 14 MC bands and should be adjusted so that no oscillation occurs in these bands. Use a plastic alignment tool so that no damage will result to the internal hexagon type slugs.

5. **RF amplifier**

Connect S.G. to antenna. On 3.5 MC band set VFO to "O" on black scale and GRID to second point up from its counterclockwise position. Apply 3500 kc signal and adjust L7 and L12 for maximum S-meter reading. Use plastic alignment tool. 7 MC band, VFO to "O" on red scale, GRID at same point as for 3.5 MC, S.G. at 7000 kc. Adjust TC1 and TC2 for maximum.

14 MC band, VFO to 250, GRID at center position, S.G. at 14250 kc. Adjust L10 and L15 for maximum.

21 MC band, VFO to 250, GRID at center, S.G. at 21250 kc. Adjust L9 and L14 for maximum.

28.5 MC band, VFO to 500, GRID at center, S.G. at 29,000 kc. Adjust L3, L8 and L13 for maximum.

On 7 MC band, VFO to 500, apply 9 MC signal of sufficient level to give an S-meter reading; then adjust L2 for minimum dip in S-meter reading.

TRANSMITTER ALIGNMENT

The transmitter uses many common receiver circuits; therefore it is necessary to first correctly align the receiver section. A 50–75 ohms dummy load must be used on the transceiver during transmitter alignment. Take care to avoid touching H.V. points!

1. **Balanced modulator**

Function switch to TUNE, meter to P.O., tune transmitter for maximum reading. (Keep IC down by use of MIC gain).

Now function to SSB, MIC gain to zero, and adjust VR106 for minimum reading. For most sensitive indication, connect RF probe to dummy load, or use another receiver and observe its S-meter reading.

Then switch to opposite sideband position, and readjust VR106. Repeat several times for best result. If there is a marked difference between the two positions, then adjustment of carrier oscillator or crystal filter may be required.

2. **Crystal filter**

The filter is aligned once in receiver alignment, but further alignment in this section (transmitting) is necessary.

At the TUNE position adjust L103, L104 and L105 for maximum output. Keep drive reduced to a fairly low level for the most accurate determination of the maximum peak. In order to examine filter characteristics, set function to SSB and connect an A.F. generator to MIC jack, then take a curve of the A.F. response (in effect, the filter passband), by plotting between 300–2500 cps. If output level changes no more than 3 dB, then it is OK. Repeat on reverse sideband. If the two curves do not match, then a slight adjustment of each carrier crystal frequency is necessary to bring the two curves together in their frequency limits. If carrier is too close to 9000 kc filter center frequency, then high audio frequencies will be attenuated. If carrier is too far removed, then low frequencies will be attenuated. Carrier frequency adjustment is by TC101 and TC102.

3. **Driver stage**

Set up transmitter on TUNE, but keep level down to safe limit by adjustment of MIC gain control; then adjust driver coils and trimmer condensers for peak in output, as in receiver section alignment.

4. FINAL AMPLIFIFR NEUTRALIZATION

When replacing the final amplifier tubes, it may be necessary to reset the bias to give correct idle current and check neutralization. Using the procedure outlined below will guarantee maximum output and long tube life.

CAUTION

HIGH VOLTAGES ARE PRESENT ON UNDERSIDE OF CHASSIS AND INSIDE OF FINAL COMPARTMENT. USE GREAT CARE WHILE MAKING ADJUSTMENTS WITH WIRING EXPOSED.

(1) Connect a dummy load to antenna, and set meter to IC.

(2) Locate TC-3 the neutralization variable capacitor shaft in the final amplifier compartment.

(3) Check final amplifier idle current in USB or LSB position and adjust as described before.

(4) Tune up the transceiver at 21.5 MHz, with MODE switch at AM position, and advance CARRIER potentiometer ⑫ or the rear panel until meter IC reads 150 MA.

(5) Rotate PLATE tuning control and observe dip as indicated on the meter. If the dip is not prominent, reduce loading control slightly for better indication. As the PLATE control is rotated the meter should rise equally and smoothly on either side of maximum dip indication.

(6) Determine which side of the dip rises abruptly. Set PLATE control slightly to this side of dip keeping the meter reading below 150 MA.

(7) Using no metallic tuning wand, rotate neutralization capacitor shaft very slightly in the direction which reduces the current shown on the meter. Repeat steps 6 and 7 until the meter indicates a smooth and equal rise on either side of the maximum dip point.

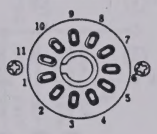
The final compartment cover must be in place to supply the RF shielding required during the neutralization procedure.

Plug connection

ACCESSORY SOCKET CONNECTIONS

1. 6JS6A heater
2. 12.6V heater
3. +150V
4. +300V
5. +600V
6. −100V
7. ALC input
8. Ground
9. Relay close on transmit −use to control linear amplifier
10. Relay common
11. Relay close on receive

ACC OUT

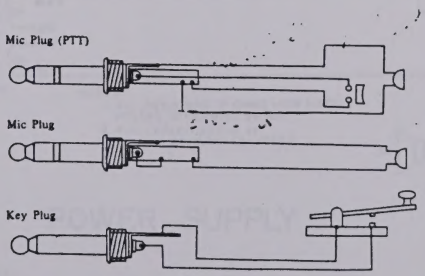


Power socket connections

1. −100V
2. E
3. +300V
4. +600V
5. H COMMON
6. H AC 12.6V
7. SPEAKER
8. H AC 12.6V
9. LINE
10. LINE
11. +150V

EXT VFO

1. 12VAC
2. GROUND
3. EXT VFO INPUT
4. GROUND
5. INT VFO CONTROL
6. 9VDC OUT
7. 9VDC OUT

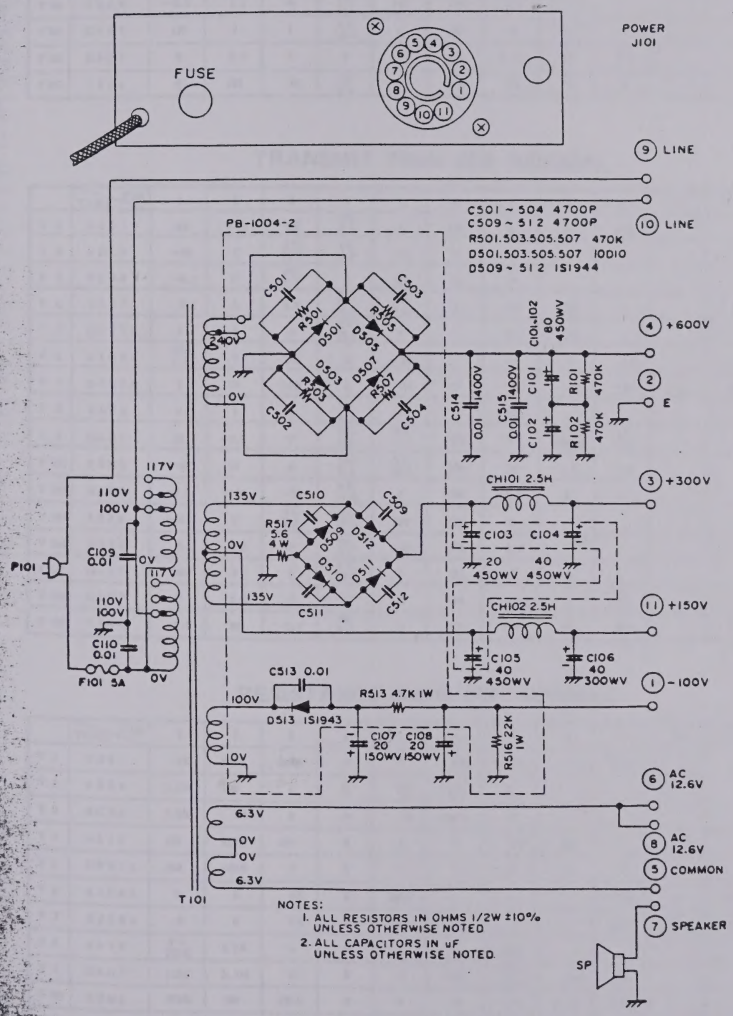


TEMPO AC/*one* POWER SUPPLY WITH SPEAKER

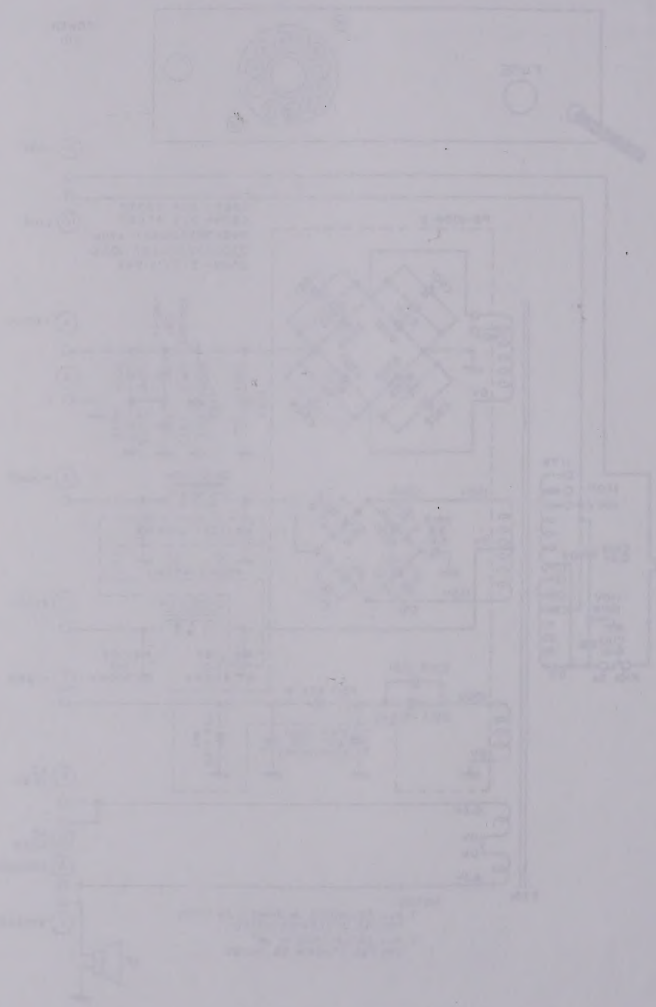
The *TEMPO AC/one* power supply is designed especially for the *TEMPO one* Transceiver. A dynamic speaker is included within the power supply cabinet. Refer to circuit diagram below for details. Note that the major HT winding is tapped 240, 460 and 600, providing DC output of 300V, 600V or 800V to the final tubes. However, for the *TEMPO one*, 600V DC is sufficient for rated output. If 800V is used, then the input will be excessive — use only on 600V DC maximum.

Bias section has only half wave rectifier as current drain is very small.

Heater winding, 2 x 6.3V, 6A is connected in series to provide 12.6V at 6A.



POWER SUPPLY



RECEIVE 7MHz SSB NORMAL

(V)

	TUBE \ PIN	1	2	3	4	5	6	7	8	9	10	11	12
V 1	6U8	150	−1.8	33	AC 6.3	0	145	1	14.5	13.5			
V 2	6BZ6	−0.1	0.8	AC 12.6	AC 6.3	140	60	0					
V 3	6CB6	−0.2	2	AC 6.3	0	145	40	0					
V 4	6EJ7	0	−90	0	AC 12.6	AC 6.3	0	145	0	0			
V 5	12BY7A	0	−90	0	AC 12.6	0	—	350	320	0			
V 6	6JS6A	AC 6.3	0	150	0	−90	—	—	—	−90	0	150	AC 12.6
V 7	6JS6A	0	0	150	0	−90	—	—	—	−90	0	150	AC 6.3
V 8	6AV6	0	1	0	AC 6.3	—	—	110					
V 9	12AU7	25	−0.5	0	AC 6.3	AC 6.3	140	0.35	55	AC 12.6			
V 101	6BM8	0	10	0	AC 6.3	AC 12.6	330	140	1	65			
V 102	12AX7	−0.2	−95	−95	AC 12.6	0	150	−1.5	0	—			
V 103	6BZ6	−0.1	1	AC 6.3	AC 12.6	145	100	1					
V 104	6BA6	−0.1	1.2	0	AC 6.3	145	110	1.2					
V 105	12AX7	110	0	1	AC 12.6	0	140	0	0	—			
V 106	12AU7	0	3.5	6	0	0	130	0.15	6	AC 6.3			
V 107	7360	0	150	−95	AC 6.3	0	150	150	30	30			

TRANSMIT 7MHz SSB NORMAL

(V)

	TUBE \ PIN	1	2	3	4	5	6	7	8	9	10	11	12
V 1	6U8	150	−80	145	AC 6.3	0	150	0	0	−60			
V 2	6BZ6	−60	0	AC 12.6	AC 6.3	145	0	0					
V 3	6CB6	−0.2	2	AC 6.3	0	145	40	0					
V 4	6EJ7	2.2	0	2.2	AC 12.6	AC 6.3	0	145	120	0			
V 5	12BY7A	5	0	0	AC 12.6	0	—	330	240	0			
V 6	6JS6A	AC 6.3	0	150	0	−50	—	—	—	−50	0	150	AC 12.6
V 7	6JS6A	0	0	150	0	−50	—	—	—	−50	0	150	AC 6.3
V 8	6AV6	0	1	0	AC 6.3	—	—	110					
V 9	12AU7	25	−0.5	0	AC 6.3	AC 6.3	100	0.4	PTT15 VOX15	AC 12.6			
V 101	6BM8	−80	10	0	AC 6.3	AC 12.6	330	140	1.5	140			
V 102	12AX7	−0.2	−95	−95	AC 12.6	0	120	−1.5	0	—			
V 103	6BZ6	−60	0	AC 6.3	AC 12.6	150	120	0					
V 104	6BA6	0	1.2	0	AC 6.3	140	110	1.2					
V 105	12AX7	105	0	1	AC 12.6	0	105	0	1	—			
V 106	12AU7	0	3.5	6	0	0	130	0.15	6	AC 6.3			
V 107	7360	1.8	90	−1.3	AC 6.3	0	110	110	30	30			

RESISTANCE 7MHz SSB NORMAL

(Ω)

	TUBE \ PIN	1	2	3	4	5	6	7	8	9	10	11	12
V 1	6U8	8K	500K	500K	0	0	9K	1K	1K	100K			
V 2	6BZ6	3.5M	100	0	0	9K	20K	0					
V 3	6CB6	1.5K	1K	0	0	9K	280K	0					
V 4	6EJ7	470	220K	470	0	0	0	9K	18K	0			
V 5	12BY7A	200	170K	0	0	0	0	∞	∞	0			
V 6	6JS6A	0	0	8K	0	100K	—	—	—	100K	0	8K	0
V 7	6JS6A	0	0	8K	0	100K	—	—	—	100K	0	8K	0
V 8	6AV6	0 ~ 250K	2.2K	0	0	—	—	110K					
V 9	12AU7	110K	3.3M	0	0	0	15K	1 ~ 3M	8K	0			
V 101	6BM8	470K	390	220K	0	0	∞	9K	4.7K	220K			
V 102	12AX7	3.3M	1.3M	330K	0	0	∞	100K	4	0			
V 103	6BZ6	3.3M	75	0	0	9K	15K	0					
V 104	6BA6	3.3M	100	0	0	9K	15K	0					
V 105	12AX7	110K	0 ~ 250K	2.2K	0	0	110K	220K	2.2K	0			
V 106	12AU7	∞	85K	1K	0	0	10K	85K	1K	0			
V 107	7360	1K	160K	600K	0	0	35K	35K	55K	55K			

C-CAPACITOR

63, 161	FM-MICA	500WV	5P	±10%
402		〃	8P	〃
12, 17, 42, 44, 112, 139, 201, 306		〃	10P	〃
11, 119, 132, 141, 403, 417		〃	20P	〃
406		〃	30P	〃
602, 99		〃	40P	〃
22, 23, 36, 138		〃	50P	〃
28, 91, 92, 604		〃	60P	〃
38		〃	70P	〃
134		〃	80P	〃
16, 20, 31, 35, 49, 89, 90, 113 116, 117, 122, 123, 127, 142 154, 166		〃	100P	〃
39, 148, 149, 204, 305		〃	150P	〃
605		〃	170P	〃
32, 40		〃	200P	〃
408		〃	250P	〃
37, 133, 140, 511		〃	300P	〃
30, 601, 603		〃	350P	〃
2, 43, 64, 109, 110, 128, 163 168, 169, 172, 303, 409, 410		〃	470P	〃
61, 415		〃	680P	〃
60		〃	1000P	〃
33, 34, 301		〃	2000P	〃
67	MYLAR	250WV	0.047μ	
7, 8, 106, 107 124, 302	〃	50WV	0.1μ	
151	OIL	400WV	0.047μ	
103	〃	〃	0.01μ	
6	MP	250WV	0.047μ	
41	MICA	1.5KWV	50P	
55	〃	1KWV	100P	
58	〃	3KWV	500P	
98	CERAMIC	AC3KV	100P	
※413	〃	500WV	3～5P UJ	
※414	〃	〃	7～10P UJ	
404	〃	〃	20P UJ	
420, 421	FEEDTHROUGH BYBASS	500WV	1000P	$^{+20\%}_{-0}$
131, 160	ELECTROLYTIC	10WV	10μ	
155, 502, 503, 508, 5	〃	16WV	10μ	
29	〃	300WV	20μ	
85, 93	〃	150WV	1μ	
101	〃	15WV	30μ	
104	〃	150WV	30μ	
111	〃	350WV	10μ	
501	〃	16WV	470μ	
506	CERAMIC DISC	50WV	0.002μ	
164	〃	500WV	0.0047μ	
59, 70, 71, 76	〃	14KV	4700P	
46, 50, 202, 401, 405 407, 411, 416, 418, 504 505, 507, 509, 510	〃	50WV	0.01μ	
4, 14, 18, 68, 144 157, 1008	CERAMIC DISC	500WV	0.001μ	
3, 9, 13, 15, 19, 24, 25, 27, 45, 47, 48, 51, 53, 54, 56, 57 65, 66, 69, 73, 75, 78, 87, 88 94, 100, 1001, 1007, 102, 105 108, 114, 115, 118, 120, 121 125, 126, 129, 130, 136, 137 143, 145, 146, 147, 150, 152 153, 156, 158, 159, 162	〃	500WV	0.01μ	
72, 74, 80～83, 95, 96, 97	〃			
203, 205, 206, 207, 304, 419		50WV	0.047μ	

R-RESISTOR

63	½W	22Ω	±10%
66, 68, 70, 71	〃	56Ω	〃
115	〃	68Ω	〃
10,25,120,411,412,805,513	〃	100Ω	〃
48, 510, 803	〃	150Ω	〃
301, 408, 410, ※78, 804	〃	220Ω	〃
145, 203, 204	〃	330Ω	〃
501	〃	390Ω	〃
45	〃	470Ω	〃
503	〃	560Ω	〃
76	〃	680Ω	〃
21, 22, 28, 32, 53→117, 123, 137, 138, 139, 148, 502	〃	1KΩ	〃
29, 41, 122, 504, 602	½W	1.5KΩ	±10%
3, 27, 43, 54, 59, 134, 160, 405, 409	〃	2.2KΩ	〃
402, 802	〃	3.3KΩ	〃
102, 126, 147, 159, 201 505, 509	〃	4.7KΩ	〃
406	〃	8.2KΩ	〃
1, 9, 46, 52, 62, 64, 72, 73 111, 114, 118, 163, 302, 401	〃	10KΩ	〃
403	〃	18KΩ	〃
130, 154, 202, 512	〃	22KΩ	〃
801	〃	27KΩ	〃
36, 38, 404, 506, 511	〃	33KΩ	〃
37, 39, 40, 42, 47, 119, 143 144, 146, 149, 151, 152, 153 164, 165, 166, 507	〃	47KΩ	〃
2, 5, 6, 19, 44, 56, 65, 110 112, 128, 131, 132, 133, 136 140, 155, 156, 303	〃	100KΩ	〃
150	½W	150KΩ	±10%
103, 104, 108, 116, 121	〃	220KΩ	〃
125	〃	330KΩ	〃
20, 23, 26, 105, 135 141, 142, 157, 158	〃	470KΩ	〃
7, 8, 127	〃	1MΩ	〃
18, 51	〃	1.5MΩ	〃
107, 109	〃	2.2MΩ	〃
4, 124, 129	〃	3.3MΩ	〃
67, 69	1 W	56Ω	〃
60	〃	120Ω	〃
101	〃	390Ω	〃
57	〃	10KΩ	〃
33	〃	18KΩ	〃
11, 407, 603, ※75	2 W	22KΩ	〃
77	5 W	5.6KΩ	〃
55	10W	5KΩ	〃

VC-VARIABLE CAPACITOR

1	RPESELECTOR	(330P+20P)×3
2	PLATE	300P MAX
3	LOAD	340P×2
401	VFO OSC	37P×2

TC-TRIMMER CAPACITOR

1, 2	KT-G-50P (MICA)
3	150C 10P 1.5KV AIR
101, 102	1ZW-10P CERAMIC
201～206	1ZW-20P CERAMIC
301	DT-120 50P
401	30P AIR
402	10P×2 AIR

TR-TRANRISTOR

201, 401, 402, 502, 801	2SC372Y
301, 501	2SC367Y (25C735Y)
503	2SC373 (2SC828 Q)

D-DIODE

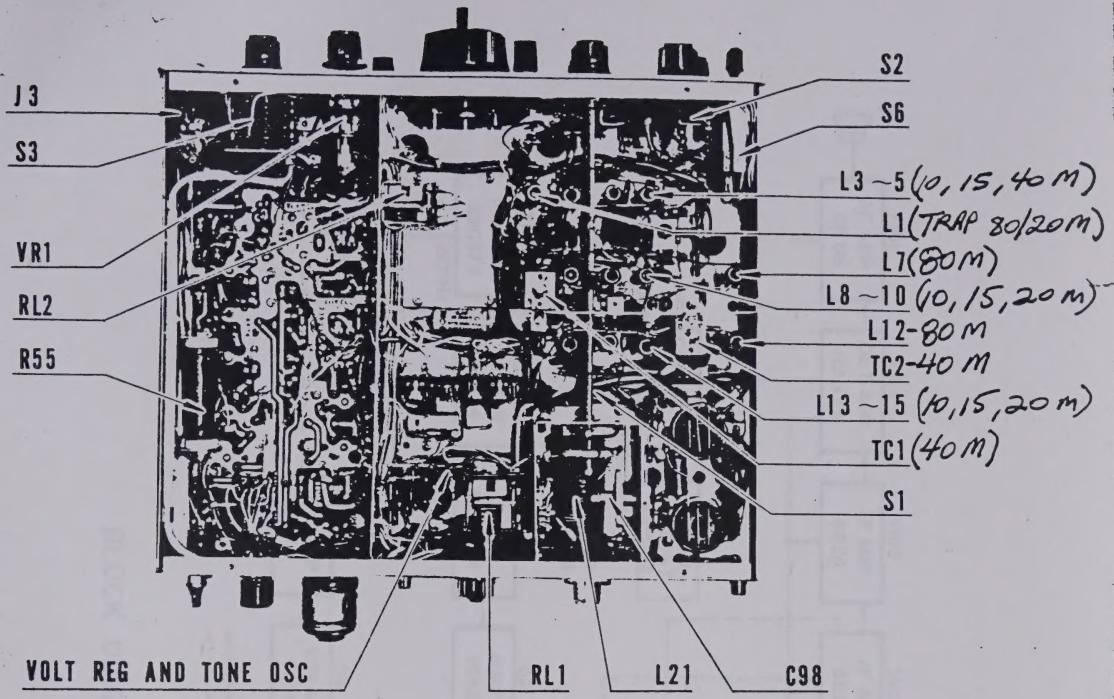
1～5, 101～103, 106	SH-1 (1S1941) SILICON
6, 7, 104, 105, 301	1S1007 GER.
401	1S145 VARI CAP.
501	1S336 11V ZENER
502	1S336 6V ZENER

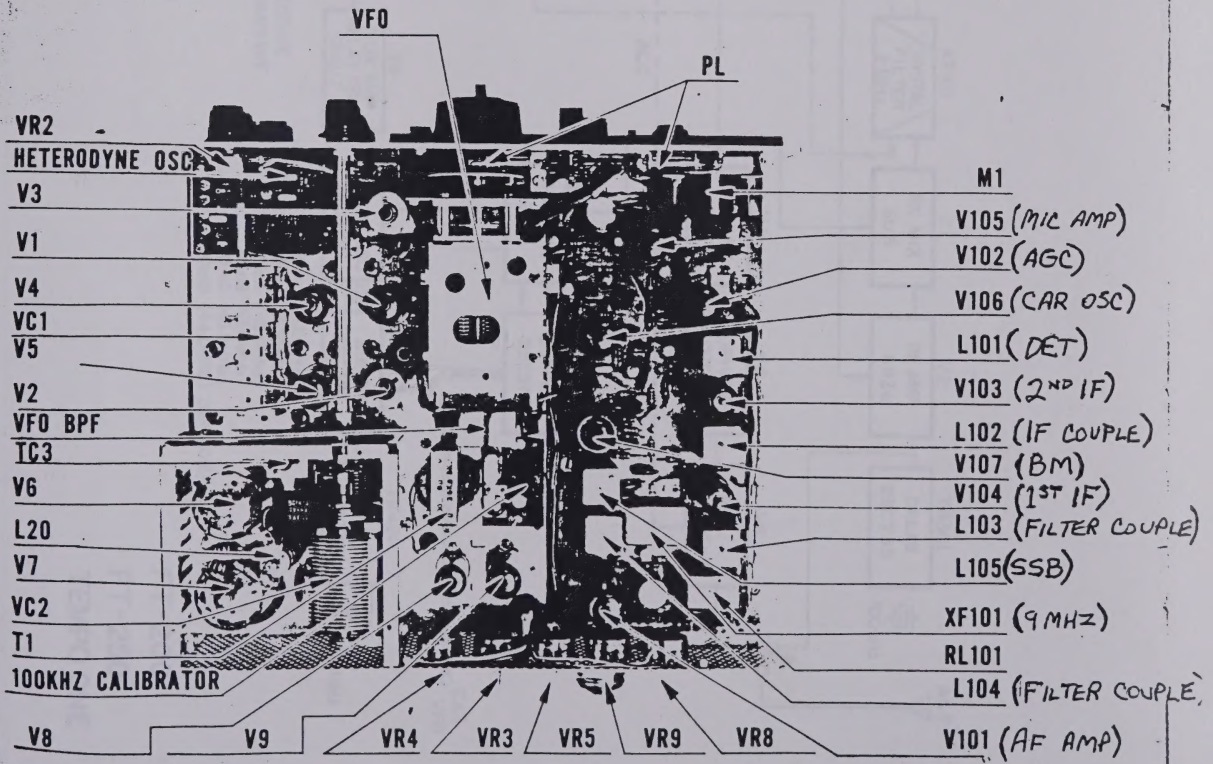
VR-VARIABLE RESISTOR

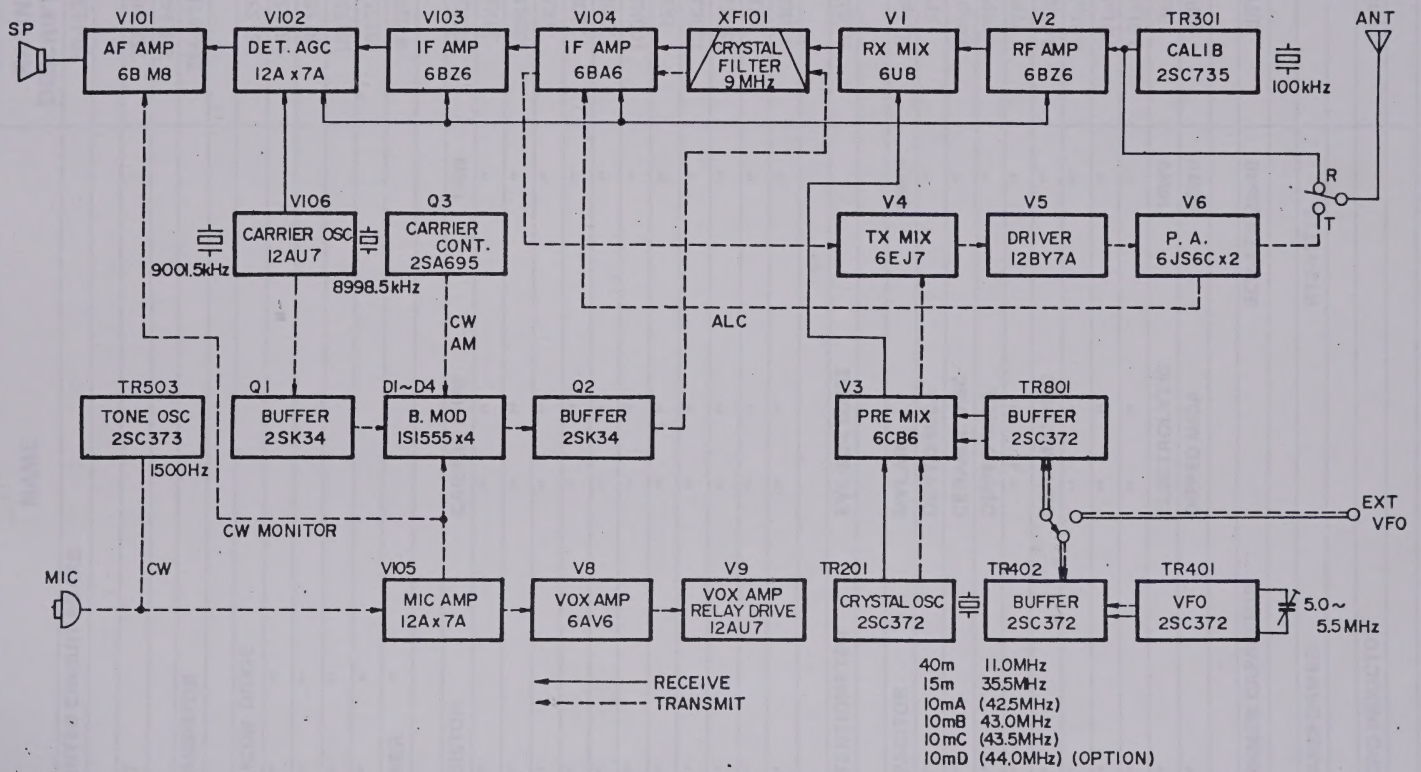
1	AF+RF GAIN	500K-A+10K-C
2	MIC GAIN	500K-A
3	ANTI TRIP	100K-B
4	VOX GAIN	500KA
5	DELAY	3M-B
6	CLARIFIER	50KB+SW
7	(RFA)	50K-B (20KB)
8	CARRIER	3M-B
9	RELAY SENS	3K-B
101	(ALC ADJ)	2K-B
102	(AGC ADJ)	10K-B
103	BIAS	20K-B
104	SM-SENS	5K-B
105	SM-ZERO	500-B
106	CARRIER BALANCE	5K-B
501	(VOLT ADJ)	1K-B
502	(TONE OUT ADJ)	10K-B
503	(TONE F ADJ)	10K-B
504	(TONE OSC ADJ)	10K-B

	RL-RELAY	
1	(ANT)	AE3254 DC100V
2		AE3218 DC12V
101	(VOX)	AE3254 DC100V
	XF-CRYSTAL FILTER	
101		XF-9 9MHz
	X-CRYSTAL	
101	(LSB)	HC/18U 9001.5KHz
102	(USB)	〃 8998.5KHz
201	7.0	HC/18U 11MHz
202	21.0	〃 33.5MHz
203	28.0 (OPTION)	〃 42.5MHz
204	28.5	〃 43.0MHz
205	29.0 (OPTION)	〃 43.5MHz
206	29.5 (〃)	〃 44.0MHz
301	CALIB	HC/13U 100KHz
	PL-PILOT LAMP	
1, 2		15V SWAN
	T-TRANSFORMER	
1	(OPT)	5K; 600 8Ω
	M-METER	
1		TYPE 45 500μA (SHUNT)
	PB-PRINTED BOARD	
PB-1046		GENERATOR
〃 1061		VFO
〃 1068		CALIBRATOR
〃 1044		VFO BPF
〃 1066		VOLT REG+TONE OSC
〃 1041		HETERODYNE OSC
〃 1093		BUFF
	S-SWITCH	
1	BAND 1	5-10-5
2	〃 2	1-2-4
3	FUNCTION	4-8-5
4	SIDE BAND	MS-102-1
5	PTT/VOX	〃
6	OPER/REC/CAL	
7	ALC/IC/PO	SS(H) 23 08
8	VFO SELECT	ESR-E1-4-3
9	POWER	AM5206 (S3)
	V-VACUUM TUBE	
1		6U8
2, 103		6BZ6
3		6CB6
4		6EJ7
5		12BY7A
6, 7		6JS6A
8		6AV6
9, 106		12AU7
101		6BM8
102, 105		12AX7A
104		6BA6
107		7360
	VS-VACUUM TUBE SOCKET	
1, 4, 5, 9		(9P) SB-1222
8		(7P) SB-0822
2, 3		(7P) S7-201Y-04
6, 7		(12P) SB-0703
101, 102, 105, 106		(9P) SB-1307-2
103, 104		(7P) SB-0905-2
107		(9P) SB-1330-2
	J-JACK	
1	PHONES	SG-7615 2P
2	SP	RCA-7017
3	MIC	SG-7814-1 3P
4	KEY	SG-7615 2P
5	RF OUT	RCA-7017
6	ANT	JSO-239 (INCH)
7	POWER	PA-603B (11P)
8	ACC	SA-602B (11P)
9	EXT VFO	SB-0821 (7P)
	P-PLUG	
1, 4		S-H3001 (2P)
2, 5		RCA-7017
3		S-H3601 (3P)
6		M-P-7 (INCH)
7		FS-A604B (11P)
8		PA-602B (11P)
9		S-I 7302 (7P)

	L-INDUCTOR	
1	TRAP (9MHz)	USTC 0.06/4 40T
2	〃	〃
3	10M (LOCAL OSC / BPF COIL)	0.6ϕ 3T, S
4	15M 〃	〃 0.6ϕ5T; 5¾T
5	40 〃	〃 0.4ϕ8T; 8¾T
6	80/20〃	〃 0.06/4 97T;½W1.5KΩ
7	80/40〃 RF COIL	0.06/4 23T
8	10 〃	〃 0.6ϕ 5T, S
9	15 〃	〃 0.3ϕ 8T
10	20 〃	〃 0.3ϕ 8T
11	RFC	TV-245
12	80/40M RF COIL	0.06/4 23T; 0.3ϕ5T
13	10 〃	〃 0.4ϕ 5T
14	15 〃	〃 0.3ϕ 8T
15	20 〃	〃 0.3ϕ 8T
16, 18, 24	PARASTIC COIL	½W56Ω 4TS 0.6ϕ
17, 19	〃	1W 56Ω 4TS 1ϕ
20	PLATE RFC	0.29ϕ 12ϕ×75
21	TANK COIL	1.2ϕ 30ϕ×65
101	IFT (9MHz)	0.3ϕ 15T 9.5TAP
102	〃 〃	0.3ϕ 15T
103	FILTER OUT	0.16ϕ 8T; 0.3ϕ 17T
104	〃 IN	0.3ϕ 13T
105	BM-T	0.16ϕ 4T; 0.3ϕ 18T
23, 106, 107, 201, 403		MICRO INDUCTOR 250μH
202		HET OSC OUT
401		VFO OSC (15ϕ×32)
601, 607		BAND PASS (VFO) 0.08 50T
301		4mH
	(AC POWER SUPPLY)	
	C-CAPACITOR	
101, 102		ELECTROLYTIC 450WV 47μ×2 or (40μ×2)
103～105		450WV 33μ×3 or (40+40+20)
106		ELECTROLYTIC 300WV 47μ (40μ)
107, 108		ELECTROLYTIC 160WV 22μ (20μ)
109, 110, 514, 515		CERAMIC DISC 1.4KV DC 0.01μ
501～504, 509～5		CERAMIC DISC
509～512		1.4KV DC 4700P
513		CERAMIC DISC 500WV 0.01μ
	R-RESISTOR	
101, 102, 501, 503 505, 507		½W 470KΩ±10%
516		1 W 22KΩ±10%
513		〃 4.7KΩ 〃
517		4 W 5.6Ω
	D-DIODE	
501, 503, 505, 507		SILICON 10D10
509～512		〃 1S1944
513		〃 1S1943
	T-TRANSFORMER	
101		POWER TRANS
	CH-FILTER CHOKE	
101, 102		2.5H 150mA
	SP-SPEAKER	
SP		VC8Ω 1.5W
	FH-FUSE HOLDER	
101		S-N1001
	F-FUSE	
101		117V 5A
PRINTED BOARD		PB-1004-2
	J-JACK	
101	(POWER)	SA-602B (11P)

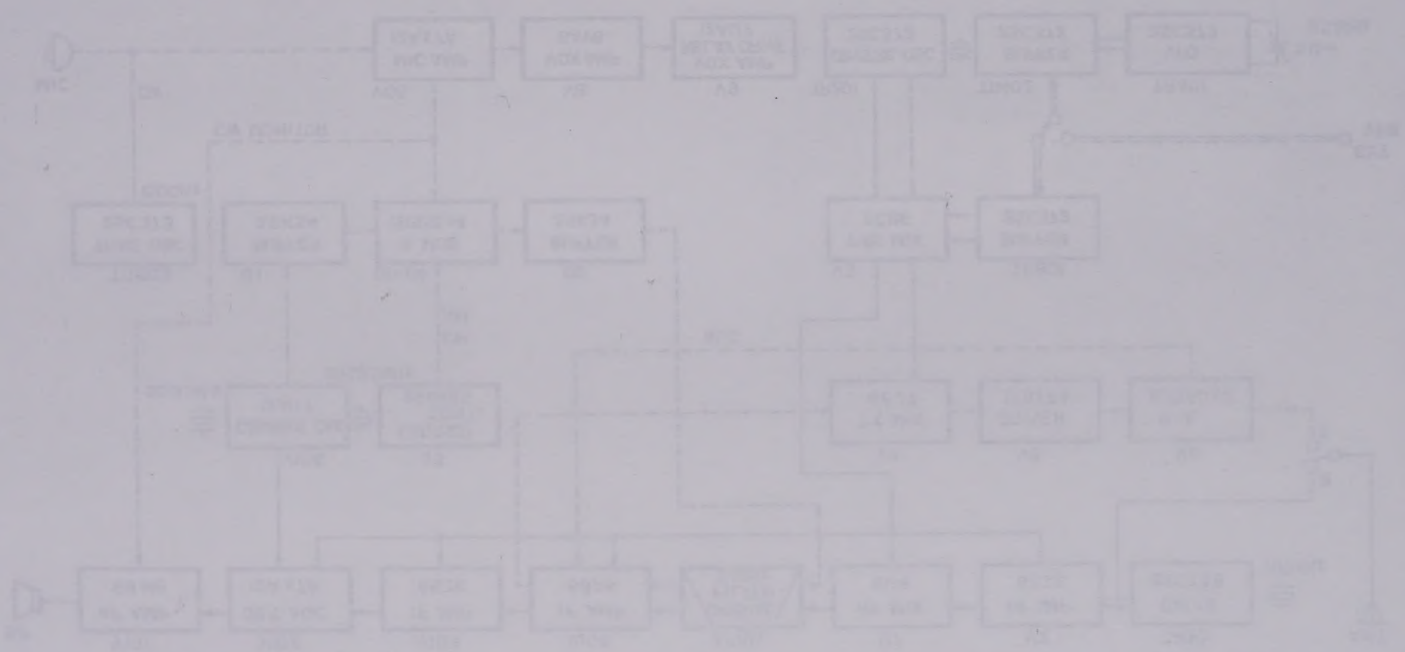

J3
S3
VR1
RL2
R55
S2
S6
L3~5 (10, 15, 40 M)
L1 (TRAP 80/20M)
L7 (80M)
L8~10 (10, 15, 20 M)
L12-80 M
TC2-40 M
L13~15 (10, 15, 20 M)
TC1 (40 M)
S1
VOLT REG AND TONE OSC
RL1
L21
C98


VFO
PL
VR2
HETERODYNE OSC
V3
V1
V4
VC1
V5
V2
VFO BPF
TC3
V6
L20
V7
VC2
T1
100KHZ CALIBRATOR
V8
V9
VR4
VR3
VR5
VR9
VR8
M1
V105 (MIC AMP)
V102 (AGC)
V106 (CAR OSC)
L101 (DET)
V103 (2ND IF)
L102 (IF COUPLE)
V107 (BM)
V104 (1ST IF)
L103 (FILTER COUPLE)
L105 (SSB)
XF101 (9 MHZ)
RL101
L104 (FILTER COUPLE)
V101 (AF AMP)



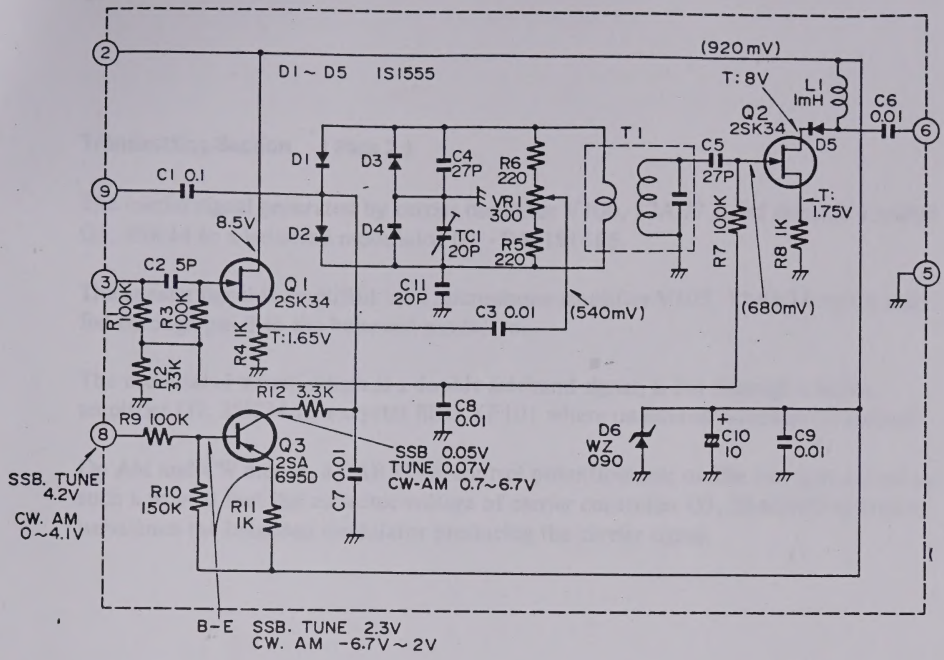
BLOCK DIAGRAM

FT-200
FT-250
TEMPO ONE

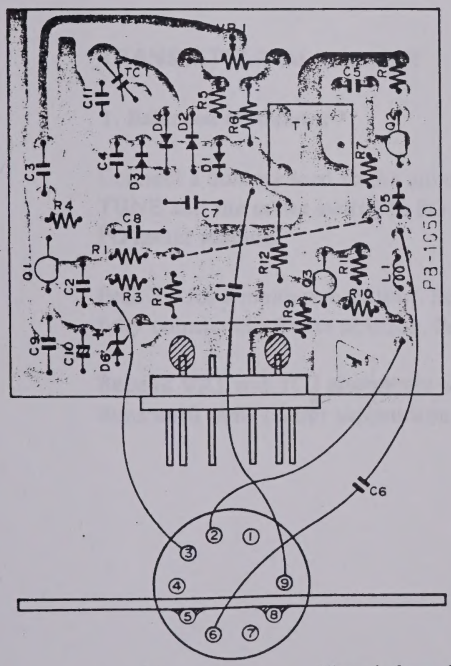


BALANCED MODULATOR UNIT

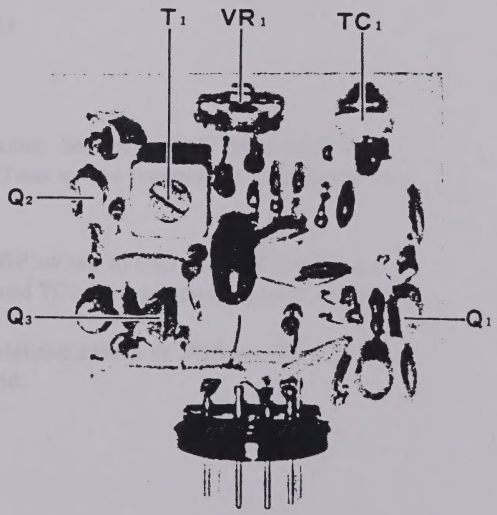
REF DESIG		NAME			RATING/ DESCRIPTION
PB		PRINTED CIRCUIT BOARD			PB-1650
Q	1	FET			2SK34E
	2	"			2SK34E
	3	TRANSISTOR			2SA695D
D	1	SILICON DIODE			1S1555
	2	" "			1S1555
	3	" "			1S1555
	4	" "			1S1555
	5	" "			1S1555
	6	ZENER "			WZ090
R	1	RESISTOR	CARBON FILM	1/4W	100KΩ
	2	"	" "	"	33KΩ
	3	"	" "	"	100KΩ
	4	"	" "	"	1KΩ
	5	"	" "	"	220Ω
	6	"	" "	"	220Ω
	7	"	" "	"	100KΩ
	8	"	" "	"	1KΩ
	9	"	" "	"	100KΩ
	10	"	" "	"	150KΩ
	11	"	" "	"	1KΩ
	12	"	" "	"	3.3KΩ
VR	1	POTENTIOMETER	EVL-SOA 00B32		300ΩB
C	1	CAPACITOR	MYLAR	50WV	0.1μF
	2	"	DIPPED MICA	"	5PF
	3	"	CERAMIC DISC	"	0.01μF
	4	"	DIPPED MICA	"	27PF
	5	"	" "	"	27PF
	6	"	CERAMIC DISC	"	0.01μF
	7	"	" "	"	0.01μF
	8	"	" "	"	0.01μF
	9	"	" "	"	0.01μF
	10	"	ELECTROLYTIC	16WV	10μF
	11	"	DIPPED MICA	50WV	20PF
TC	1	TRIMMER CAPACITOR		ECV-1ZW 20x40	20PF
T	1	TRANSFORMER		R12-4171A	
L	1	MICRO INDUCTOR			1mH
P	1	9 PIN PLUG		SI 8501	



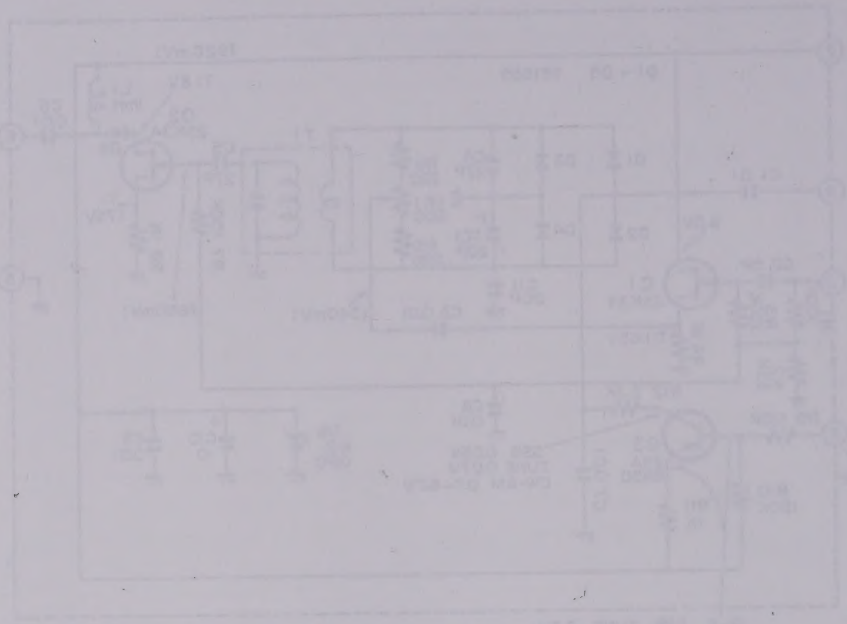
( ) Signal level.



BM Unit (PB-1650) Viewed from Solder Side



BM UNIT (PB-1650)



Transmitting Section (Page 2)

The carrier signal generated by carrier oscillator V106, 12AU7 is fed through a buffer Q1, 2SK34 to a balanced modulator D1 - D4, 1S1555.

The speech signal is amplified by a microphone amplifier V105, 12AX7A and is also fed through pin 9 to the balanced modulator.

The modulated signal, which is a double sideband signal, is fed through a buffer amplifier Q2, 2SK34 to a crystal filter XF101 where unwanted sideband is rejected.

On AM and CW modes, a CARRIER control potentiometer on the rear panel is set in such a way so that the collector voltage of carrier controller Q3, 2SA695D is used to unbalance the balanced modulator producing the carrier signal.

TRANSMITTER ALIGNMENT (Page 13)

1. Balanced modulator

Connect a dummy load to the antenna connector. Set the FUNCTION switch to TUNE and the meter switch to PO position. Tune up the transmitter for a maximum PO meter reading.

Peak T1 for a maximum output. Set the MODE switch to SSB and MIC GAIN to a fully counter-clockwise position. Peak VR1 and TC1 for a minimum power output.

Repeak VR1 and TC2 alternately with the sideband switch at NOR and REV positions until same carrier suppression is obtained.

TEMPO DC/*one* DC POWER SUPPLY

The *TEMPO DC/one* DC mobile supply is designed for the *TEMPO one* Transceiver. This supply provides all necessary voltages from 12 volt battery for mobile operation.